Amateur Television Converter
ATV-74WT
Quick Reference Page Guide

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Price: $5.00
Ramsey Publication No. MATV-79WT
Instruction manual for:
RAMSEY MODEL NO. ATV-79WT
AMATUER TELEVISION RECEIVE CONVERTER

RAMSEY

RAMSEY ELECTRONICS, INC.
793 Canning Parkway
Victor, New York 14564
Phone (716) 924-4560
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AMATEUR TELEVISION RECEIVE CONVERTER

Ramsey Electronics Model No. ATV-79WT

Receive your Amateur Television 911.25 MHz signal on any standard TV set ! Outstanding quartz locked tuning operation ensures maximum performance in a pint - sized - package ! E-Z hookup and complete usage instructions are included. Don't get left behind....see Amateur Television today !

- **Converts 911.25 ATV signals to broadcast TV channel 3.**
- **Sensitive...you bet ! 23 dB gain LNA with a helical filter to ensure maximum performance.**
- **Crystal controlled phase lock loop oscillator for drift free "rock solid" operation.**
- **PLL locking indication for worry free operation.**
- **Uses Motorola® surface mount technology (SMT) integrated circuits for dependability.**
- **Fully compatible with the Ramsey TV-007 Micro Station Television transmitter outfit.**
- **Get in on the fun of fastscan ATV !**

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RAMSEY TRANSMITTER KITS

- **TV-007 MicroStation Transmitter**
- **FM-25 synthesized FM Transmitter**
- FM-10 Stereo FM Transmitter
- **AM-1 AM Transmitter**

RAMSEY RECEIVER KITS

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- **AR-1 Aircraft Band Receiver**
- **SR-1 Shortwave Receiver**
- **AA-7 Active Antenna**
- **SC-1 Shortwave Converter**

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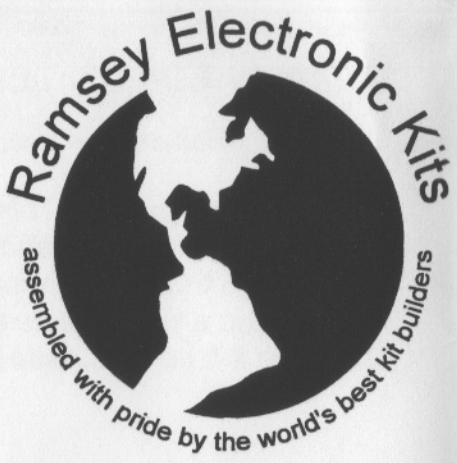
- **SS-7 Speech Scrambler**
- **MM-5 Music Machine**
- **MX Series High Performance Mixer**
- **MD-3 Microwave Motion Detector**
- **PH-10 Peak hold Meter**
- **LC-1 Inductance-Capacitance Meter**



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- **FX Series VHF and UHF Transceivers**
- **HR Series HF All Mode Receivers**
- **QRP Series HF CW Transmitters**
- **CW-70 CW Keyer**
- **PA Series VHF and UHF Power Amplifiers**
- **Packet Computer Interfaces**
- **QRP Power Amplifiers**

RAMSEY MINI-KITS

Many other kits are available for hobby, school, Scouts and just plain FUN. New kits are always under development. Write or call for our free Ramsey catalog.

ATV-79 AMATEUR TELEVISION CONVERTER INSTRUCTION MANUAL
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INSTRUCTION MANUAL FOR

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INTRODUCTION

Welcome to the world of fast scan Amateur Television (or ATV for short). Many radio amateurs are discovering that, as the old saying goes, " a picture is worth a thousand words". In conjunction with the video "revolution" of recent years, inexpensive cameras have made this part of the hobby more and more practical.

In more recent memory, miniaturization has become a key issue in the use of video. Mini cameras seem to be popping up everywhere! The limitations for their use seem only bounded by the creativity of the designer. Their miniature size and low power requirements make them ideal for radio controlled models as well as surveillance applications, with one *big* problem...how do we get the video and audio to our television monitor?!

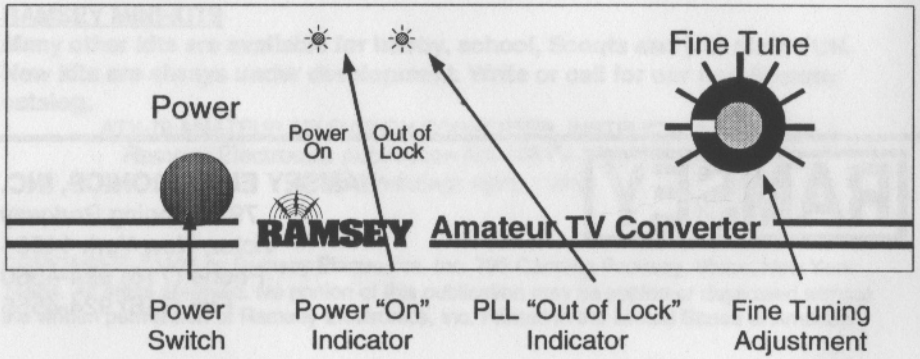
The answer to our question isn't that difficult, just use ATV!

We can broadcast our video and audio information at an amateur UHF frequency, and downconvert it to the proper frequency for a standard television receiver (that's a TV set!). Although this isn't such a new idea, the engineers here at Ramsey have come up with some modern day answers to the age old problems inherent with ATV transmission. We'll get into the technical talk a little later.

Enter the Ramsey ATV-79WT amateur television downconverter unit. With superior sensitivity, selectivity, and tuning control we offer the easiest and most reliable way to make your start or continue your journey in the world of ATV.

ATV-79 CONTROLS

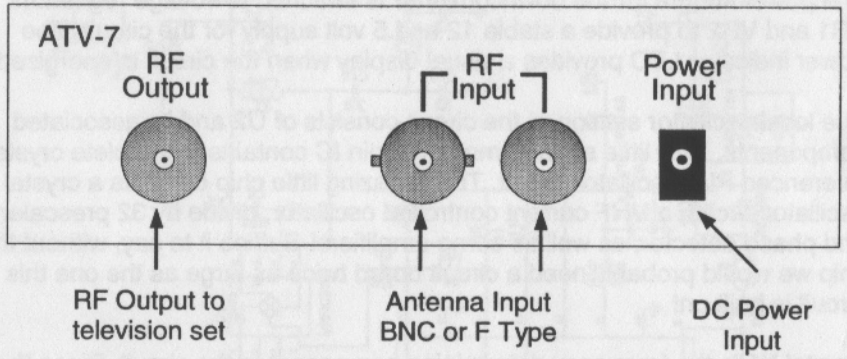
Located on the front of your ATV-79WT unit are a few simple controls and indicators, have a look at the diagram to familiarize yourself with them.



- ❒ Power Switch — Push "on" type power switch.
- ❒ Power On Indicator — Illuminates when power is switched on.
- ❒ Pll "Out of Lock" indicator — Illuminates if the phase lock loop circuit is not in "locked" mode. This typically should be "off" , or not illuminated.
- ❒ Fine Tune Control — This allows for adjustment of the receive frequency of the ATV converter unit.

REAR PANEL CONNECTIONS

Here's a look at the rear panel of the ATV-79WT to help with your connections to the unit.

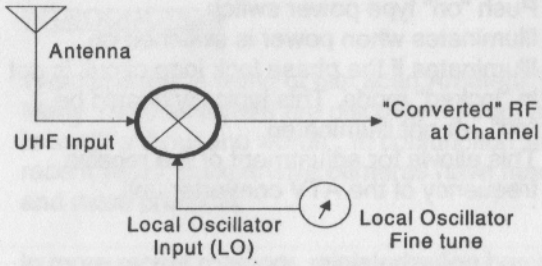


- ❒ RF Output — Connects to the "VHF" terminal on your TV set. Important Note: TV should be tuned to Channel 3
- ❒ RF Input(s) — Allows for connection of "F" type or "BNC" type connector to receiving antenna.
- ❒ Power Input — DC power connection (DC 12 - 14 Volts, "tip" positive, "ring" negative).

ATV-74 CIRCUIT DESCRIPTION

The following paragraphs describe the circuit theory for our ATV downconverter, have a look at the block diagram (pg.6) and schematic diagram (pg. 7) and follow along.

We'll start by describing the entire circuit operation with the block diagram. We need to take all of the video and audio information contained in the high frequency and "mix" it down to our television's receive frequency. This is accomplished combining a "local oscillator", or LO, with the incoming receive signal. In this mixing process, the result is the sum and difference between the two frequencies.



Mathematically speaking,

UHF (MHz) + LO (MHz) &

UHF (MHz) - LO (MHz).

We'll only really be interested in the difference component of this mixing action. Now on to the schematic diagram to see how this is done.

The power source for the downconverter is switched to voltage regulators VR1 and VR2 to provide a stable 12 and 5 volt supply for the circuit. The power indicator LED provides a visual display when the circuit is energized.

The local oscillator section of the circuit consists of U2 and its associated components. This little surface mount 16 pin IC contains a complete crystal referenced PLL oscillator circuit. This amazing little chip contains a crystal oscillator circuit, a UHF current controlled oscillator, divide by 32 prescaler, and phase detector, as well as some amplifiers! Suffice it to say, without this chip we would probably need a circuit board twice as large as the one this circuit is built on!

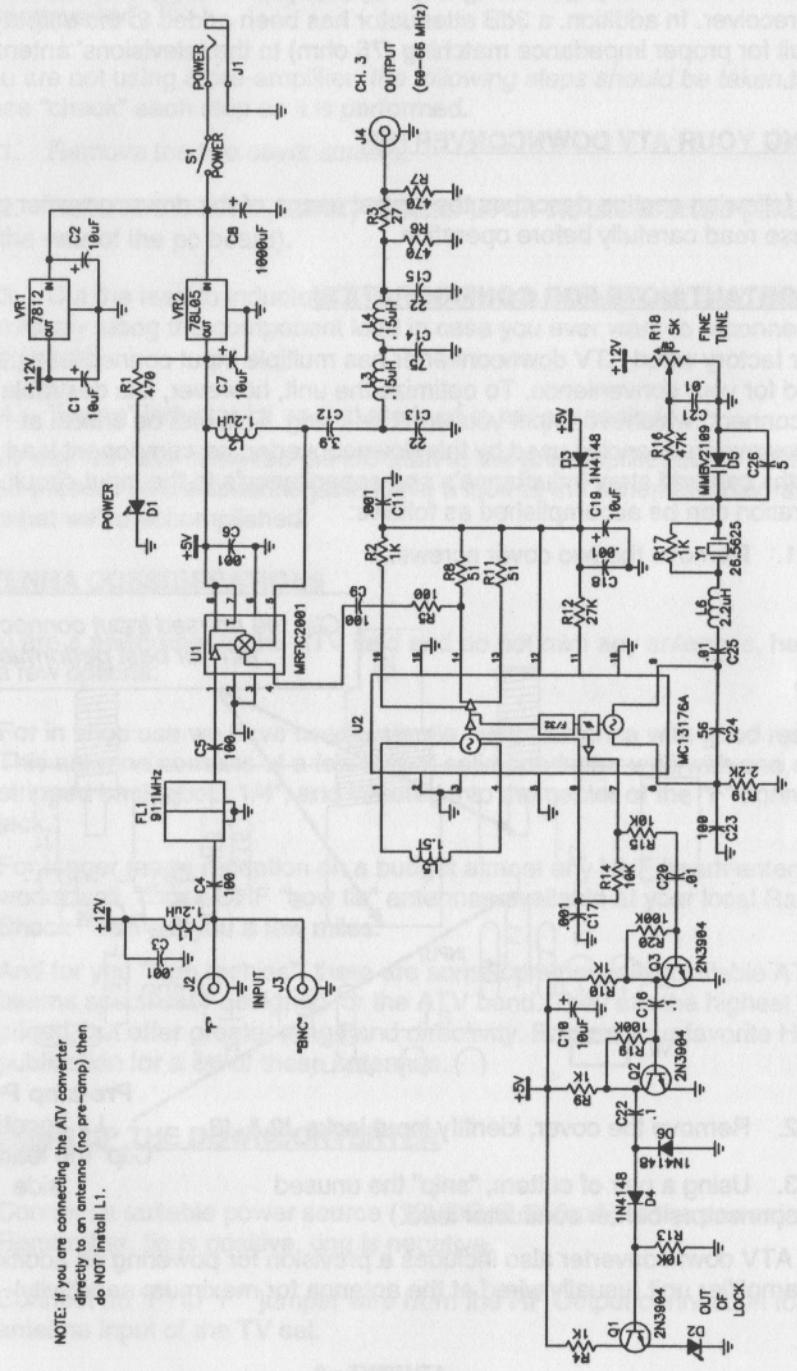
Crystal Y1 is the frequency determining component in the circuit. Since the division that is carried out inside the chip is (+ 32), the local oscillator frequency can be calculated by multiplying the crystal frequency by the "divide by N"component of the PLL, or 26.5625 MHz x 32 = 850 MHz. Diode D5 is a "varactor", that is, the capacitive properties of this reverse biased diode junction are used to effect the crystal frequency slightly, thus enabling us to tune the LO output. Resistor R18, the fine tune adjustment, lets us change the voltage on the varactor and provides for a stable tuning control.

The phase detector output (pin 7) is filtered and sent back to control the UHF oscillator internal to the IC. If this circuit becomes "unlocked" a small AC voltage will be present on pin 7. This voltage is amplified by Q3 and Q2, rectified by D4 & 6, and used to turn on transistor Q1, thus illuminating the out of lock LED.

The mixer section of the circuit consists of U1 which includes a low noise amplifier on the input and the RF mixer in a surface mount 8 pin package. The amplifier boasts a conversion gain of 23 dB (that's over 100 times)!

Extensive filtering also ensures trouble free operation. A helical bandpass filter is used at the input to eliminate any undesired signals from entering the

ATV79 SCHEMATIC DIAGRAM



mixer (a *real* good thing considering all the gain of that LNA), while the output of the circuit is also filtered using C13-15, L3,4 prior to the connection to the T V receiver. In addition. a 3dB attenuator has been added to the output circuit for proper impedance matching (75 ohm) to the televisions' antenna input.

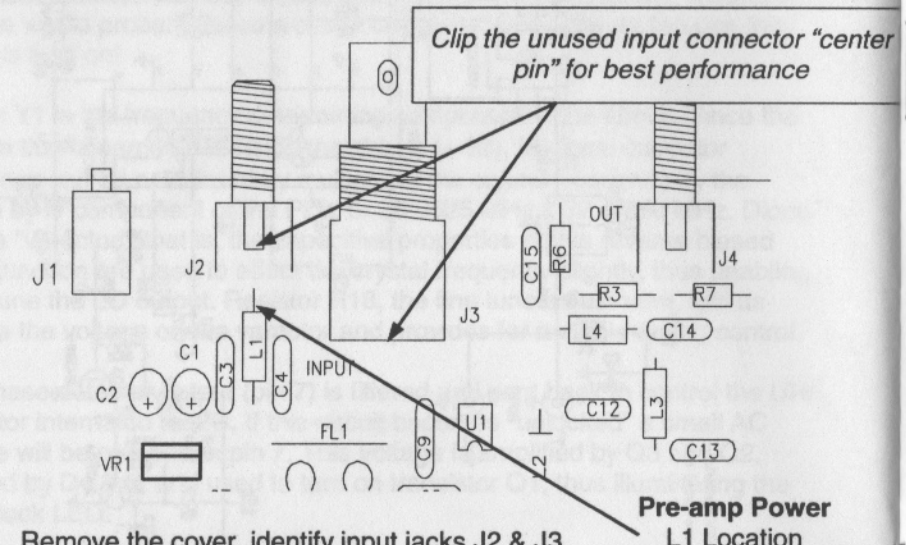
USING YOUR ATV DOWNCONVERTER

The following section describes the typical usage of the downconverter unit. Please read carefully before operation.

IMPORTANT NOTE FOR CONFIGURATION

Your factory wired ATV downconverter has multiple input connections pre-wired for your convenience. To optimize the unit, however, it is desirable to "disconnect" whichever input you won't be using. This can be critical at microwave frequencies used by this downconverter, as component lead lengths can add stray inductance's and capacitance's to the input circuit. This operation can be accomplished as follows:

❒ 1. Remove the two cover screws.



❒ 2. Remove the cover, identify input jacks J2 & J3.

❒ 3. Using a pair of cutters, "snip" the unused connectors center conductor lead.

The ATV downconverter also includes a provision for powering an additional pre-amplifier unit (usually wired at the antenna for maximum sensitivity). If it

is your intention to use a pre-amp (Ramsey model PRATV or equivalent) you may proceed with the installation steps (see "Hooking up the Downconverter").

If you are not using a pre-amplifier, *the following steps should be taken.* Please "check" each step as it is performed.

❒ 1. Remove the two cover screws.

❒ 2. Remove the cover, identify inductor L1 on the circuit board (towards the rear of the pc board).

❒ 3. Cut the lead to inductor L1, as shown. It is usually best to do this midway along the component lead in case you ever want to reconnect this part.

❒ 4. "Swing" inductor L1 so that the lead is not connected.

In this way we have removed the DC path to the pre-amplifier so no voltage will be present on the antenna jack. Have a look at the schematic diagram to see what we've accomplished.

ANTENNA CONSIDERATIONS

If you are a newcomer to the ATV field and do not own any antennas, here are a few options:

1. For in shop use we have used a simple "whip" antenna with good results. This antenna consists of a few feet of solid conductor wire with one end stripped back about 1/4", and inserted into the center of the "F" connector jack.
2. For longer range reception on a budget almost any UHF beam antenna works well. Those UHF "bow tie" antennas available at your local Radio Shack ® can get you a few miles.
3. And for you "high techies", there are some commercially available ATV beams specifically designed for the ATV band. They are the highest priced, but offer greater range and directivity. Browse your favorite HAM publication for a list of these antennas.

HOOKING UP THE DOWNCONVERTER

❒ Connect a suitable power source (12VDC @ 250mA) to the power jack. Remember, tip is positive, ring is negative.

❒ Connect an "F" to "F" jumper wire from the RF Output connection to the antenna input of the TV set.

- ❒ Connect the antenna wire to the suitable RF Input connector (either "F" or "BNC" type). If you do not yet have an antenna see the "Antenna Considerations" section of this manual.

- ❒ Turn on the television set and set at channel 3.

- ❒ Energize your ATV downconverter, and you're in business! You may want to use the "fine tune" adjustment for optimum picture quality.

CHANGING FREQUENCIES OF YOUR ATV DOWNCONVERTER

On occasion, it may be necessary to change either the receive frequency or output frequency of the downconverter unit. To accomplish this, the crystal reference frequency should be changed.

Here is a list of output frequencies for the unit:

Television Channel 2 - 55.25 MHz
Television Channel 3 - 61.25 MHz
Television Channel 4 - 67.25 MHz

To calculate the desired crystal frequency, use the following equation:

$$\text{Y1 Crystal Frequency} = \frac{(\text{Input Frequency} - \text{Output Frequency})}{32}$$

or for our example

$$\text{Y1 Crystal Frequency} = \frac{(911.25\ \text{MHz} - 61.25\ \text{MHz})}{32}$$

$$= 26.5625\ \text{MHz...}$$ which is the Xtal in your unit!

If you choose to change the crystal frequency, calculate your frequency, and when ordering specify your crystal type to be a third overtone, 32pF load. Crystals may be purchased from a number of vendors (such as Jan crystal by calling 1-800-JAN-XTAL).

CONCLUSION

We sincerely hope that you enjoy the use of this Ramsey product. As always, we have tried to compose our manual in the easiest, most "user friendly" format that is possible. As our customers, we value your opinions, comments, and additions that you would like to see in future publications. Please submit comments or ideas to:

Ramsey Electronics Inc.
Attn. Hobby Kit Department
793 Canning Parkway
Victor, NY 14564

And once again, thanks from the folks at Ramsey!

The Ramsey Pre-Assembled Unit Warranty

Please read carefully BEFORE calling or writing in about your unit. Most problems can be solved without contacting the factory.

Notice that this is not a "fine print" warranty. We want you to understand your rights and ours too! All Ramsey pre-assembled units were wired and tested at the factory. The very fact that your unit includes this new manual is your assurance that a team of knowledgeable technicians has field-tested it prior to shipping. If you need help, please read through your manual carefully. All information required to properly set up and operate your unit is contained within the pages!

1. WARRANTY:

All factory assembled Ramsey products are covered by a one-year warranty from the date of purchase on parts and workmanship. If you suspect your unit to be defective, please mail it to our factory for testing. If testing by Ramsey technicians determines a fault in design, workmanship, or parts, the unit will be repaired or replaced at our discretion in as prompt a manner as possible at Ramsey's expense.

2. FACTORY REPAIR OF PRODUCTS:

Factory repair is available for products no longer covered by the warranty at a basic repair fee of $49.95. To qualify for Ramsey Electronics factory repair, units MUST:

1. NOT be modified in any manner;
2. BE returned in fully-assembled form;
3. BE accompanied by the basic repair fee. No repair will be undertaken until we have received the basic repair fee of $49.95, or authorization to charge it to your credit card account.

3. RETURNING PRODUCTS:

Whether returning a product under warranty or for non-warranty repair, include a description of the problem and legible return address. DO NOT send a separate letter. Include all correspondence with the unit. Please do not include your own hardware such as non-Ramsey cabinets, knobs, cables, external battery packs and the like. Ramsey Electronics, Inc., reserves the right to refuse repair on ANY item in which we find excessive problems or damage due to improper customer trouble-shooting or repair methods. To assist customers in such situations, Ramsey Electronics, Inc., reserves the right to solve their needs on a case-by-case basis.

4. REFUNDS:

You are given ten (10) days to examine our products. If you are not satisfied, you may return your unit with all the parts and instructions and proof of purchase to the factory for a full refund. The return package should be packed securely. Insurance is recommended. Please do not cause needless delays; read all information carefully.

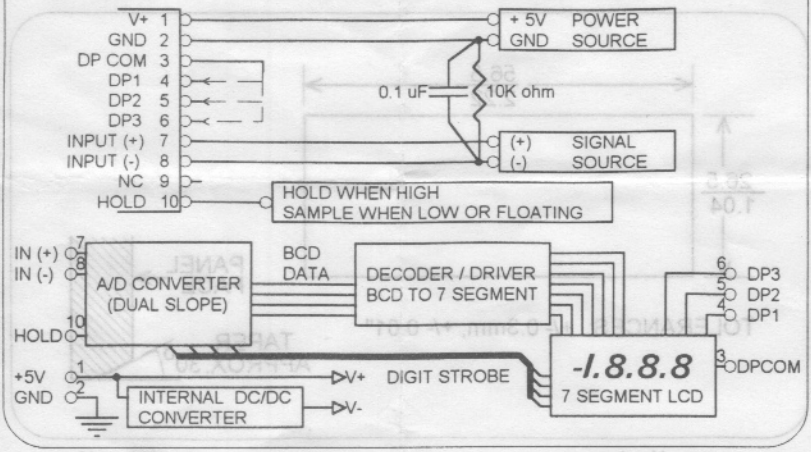
SPECIFICATIONS

DISPLAY:	3 1/2 Digit high contrast LCD.
INPUT RANGES:	+/- 200 mV, +/- 2 V, +/- 20 V DC.
LARGE NUMERALS:	0.39 Inches.
ACCURACY:	+/- 0.1%, +/- 2 Digits.
AUTOZERO.	
REQUIRED POWER:	+ 5V DC (+/- 5%) at 3 mA.
OVERRANGE INDICATION:	"1" with lower digits blanked.
OVERRANGE PROTECTION:	+/- 10V DC (200mV), +/- 350V DC (2V & 20V).
OPERATING TEMPERATURE:	0 to 50 degrees C.
STORAGE TEMPERATURE:	-10 to 60 degrees C.
FULL SCALE DIFFERENTIAL INPUT.	
COMMON MODE RANGE:	+/- 1V DC.
COMMON MODE REJECTION:	86 dB.
SAMPLING RATE:	3.4 per second.

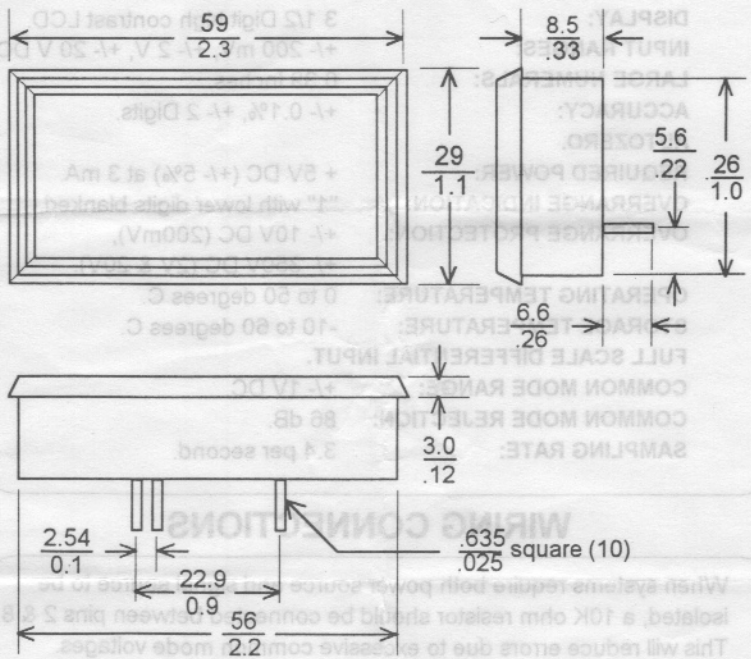
WIRING CONNECTIONS

When systems require both power source and signal source to be isolated, a 10K ohm resistor should be connected between pins 2 & 8. This will reduce errors due to excessive common mode voltages. Unused pins are left open.

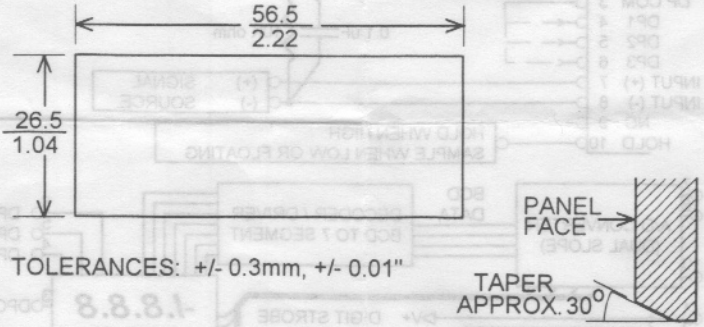
CAUTION: Damage to the unit will occur if the power source polarity is reversed , or a voltage greater than 6V is applied between pins 1 & 2.



MECHANICAL DIMENSIONS



PANEL CUTOUT DIMENSIONS



TOLERANCES: +/- 0.3mm, +/- 0.01"

mm / inches

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